



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,001	12/08/2005	Atsushi Tomozawa	5077-000249/US/NP	2768
53800 7590 03/31/2008 GREGORY A. STOBBS 5445 CORPORATE DRIVE SUITE 400 TROY, MI 48098				
EXAMINER				
WITKOWSKI, ALEXANDER C				
ART UNIT		PAPER NUMBER		
4193				
MAIL DATE		DELIVERY MODE		
03/31/2008		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/560,001

**Applicant(s)**

TOMOZAWA ET AL.

**Examiner**

ALEXANDER C. WITKOWSKI

**Art Unit**

4193

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-11 and 24-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 24-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/088)
- Paper No(s)/Mail Date 12/08/2005
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

1. Claims 1 and 24 are objected to because of the following informalities: The use of the term "preferred" leads to uncertainty regarding interpretation of claims 1 and 24. The term "preferred" should be deleted. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 6 - 11, 24, 25, 29, 31 - 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murai (US 6,705,708) in view of Takamatsu et al. (US 6,624,458).

With respect to claim 1, Murai '708 teaches a **piezoelectric element** (Fig.6: 40) **comprising a first electrode film** (Fig.6: 33), a **layered piezoelectric film** (Fig.6: 43; col.8, lines 1-8) **including a first thin piezoelectric film** (Fig.6: 43a) **provided on the first electrode film and a second thin piezoelectric film** (col.8, lines 1-8) **provided on the first thin piezoelectric film and a second electrode film** (Fig.6: 44) **provided**

**on the layered piezoelectric film, wherein the layered piezoelectric film is made of rhombohedral (col.7, lines 17-20) or tetragonal perovskite oxide (col.5, lines 21-24) having preferred orientation along the 111 plane (col.8, lines 43-47), the first and second thin piezoelectric films are aggregates of columnar grains (the first and second thin piezoelectric films are rhombohedral grains, which are columnar), respectively, which are continuously linked to each other (col.8, lines 34-38, lines 48-52), the columnar grains of the second thin piezoelectric film have a larger average cross-sectional diameter than the columnar grains of the first thin piezoelectric film (col.8, lines 21-23) and the thickness of the layered piezoelectric film (col.8, lines 8-9: disclosing layered piezoelectric film thickness of 1.5 microns).**

However, Murai '708 does not teach **the ratio of the thickness of the layered piezoelectric film to the average cross-sectional diameter of the columnar grains of the second thin piezoelectric film is 20 to 60 inclusive.**

Takamatsu et al. teaches a PZT crystal with columnar grain diameter of 20 - 50 nm in the second layer (col.7, lines 29-31).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify Murai '708 to use PZT crystals with columnar grain diameter of 20 - 50 nm, as taught by Takamatsu et al., such that the ratio of the thickness of the layered piezoelectric film to the average cross-sectional diameter of the columnar grains of the second thin piezoelectric film is 30 to 75 inclusive for the purpose reducing grain size in order to improve bonding between films. Therefore, the Takamatsu et al. ratio overlaps applicants' ratio.

With respect to claim 2, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **a piezoelectric element** (Murai '708: Fig. 6: 40), **wherein the columnar grains of the first thin piezoelectric film** (Fig. 6: 43a) **have an average cross-sectional diameter of 40 nm to 70 nm inclusive** (Takamatsu et al.: col. 7, lines 29-31: disclosing PZT columnar grain diameter of 20 - 50 nm in second layer) **and a length of 5 nm to 100 nm inclusive** (Takamatsu et al.: col. 8, lines 2-4: disclosing length of 100 nm or less).

With respect to claim 6, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **a piezoelectric element** (Murai '708: Fig. 6: 40), **wherein the layered piezoelectric film** (Fig. 6: 43; col. 8, lines 1-8) **is made of lead zirconate titanate added with at least one of magnesium and manganese in an amount of more than 0 and not more than 10 mol%** (col. 5, lines 22-26).

With respect to claim 7, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **the first electrode film** (Murai '708: Fig. 6: 33) **is made of noble metal of Pt, Ir, Pd or Ru or an alloy** (col. 6, line 42) **containing the noble metal and is an aggregate of columnar grains having an average cross-sectional diameter of 20 nm to 30 nm inclusive** (Takamatsu et al.: col. 7, lines 29-31: disclosing PZT columnar grain diameter of 20 - 50 nm in second layer).

With respect to claim 8, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **an inkjet head (Murai '708: Fig.1:1) comprising: a piezoelectric element (Fig.6: 40) including a first electrode film (Fig.6: 33), a layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) including a first thin piezoelectric film (Fig.6: 43a) and a second thin piezoelectric film (Fig.6: 43) and a second electrode film (Fig.6: 44) stacked in this order; a diaphragm layer (Fig.6: 30, 31, 32; col.2, lines 1-2) disposed on the second electrode film side surface of the piezoelectric element (Fig.6: 32; col.2, lines 8-11); and a pressure chamber member (Fig.6: 20) including a pressure chamber (Fig.6: 21) for containing ink which is bonded to the surface of the diaphragm layer opposite to the second electrode film, such that the ink in the pressure chamber is discharged out by displacing the diaphragm layer in the thickness direction by the piezoelectric effect of the layered piezoelectric film (col.3, lines 1-4).**

With respect to claim 9, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **an inkjet head (Murai '708: Fig.1:1) comprising: a piezoelectric element (Fig.6: 40) including a first electrode film (Fig.6: 33), a layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) including a first thin piezoelectric film (Fig.6: 43a) and a second thin piezoelectric film (Fig.6: 43) and a second electrode film (Fig.6: 44) stacked in this order; a diaphragm layer (Fig.6: 30, 31, 32; col.2, lines 1-2) disposed on the first electrode film side surface of the piezoelectric element (Fig.6: 31; col.2, lines 3-4); and a pressure chamber**

**member (Fig.6: 20) including a pressure chamber (Fig.6: 21) for containing ink which is bonded to the surface of the diaphragm layer opposite to the first electrode film, such that the ink in the pressure chamber is discharged out by displacing the diaphragm layer in the thickness direction by the piezoelectric effect of the layered piezoelectric film (col.3, lines 1-4).**

With respect to claim 10, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 8, teaches **an inkjet recording device (Murai '708: Fig.1) comprising an inkjet head (Fig.1: 1) and a relative movement mechanism for relatively moving the inkjet head and a recording medium (Fig.1: 1, 4, 5, 6, 7), wherein recording is carried out by discharging the ink in the pressure chamber (Fig.6: 21) from a nozzle hole (Fig.4: 11) communicating with the pressure chamber onto the recording medium while the inkjet head and the recording medium are relatively moved by the relative movement mechanism.**

With respect to claim 11, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 9, teaches **an inkjet recording device (Murai '708: Fig.1) comprising an inkjet head (Fig.1: 1) and a relative movement mechanism for relatively moving the inkjet head and a recording medium (Fig.1: 1, 4, 5, 6, 7), wherein recording is carried out by discharging the ink in the pressure chamber (Fig.6:21) from a nozzle hole (Fig.4: 11) communicating with the pressure chamber onto the recording medium while the inkjet head and the recording medium are**

**relatively moved by the relative movement mechanism.**

With respect to claim 24, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **a piezoelectric element** (Murai '708: Fig.6: 40) **further comprising an orientation control film disposed between the first electrode film** (Fig.6: 33) **and the first thin piezoelectric film** (Fig.6: 43a), **wherein the orientation control film is made of cubic or tetragonal perovskite oxide having preferred orientation along the 111 plane** (col.12, lines 30-35).

With respect to claim 25, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches **a piezoelectric element** (Murai '708: Fig.6: 40) **wherein the columnar grains of the first thin piezoelectric film** (Fig.6: 43a) **have an average cross-sectional diameter of 40 nm to 70 nm inclusive** (Takamatsu et al.: col.7, lines 29-31: disclosing PZT columnar grain diameter of 20-50 nm) **and a length of 5 nm to 100 nm inclusive** (col.8, lines 3-4: disclosing length of 100 nm or less).

With respect to claim 29, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches **a piezoelectric element** (Murai '708: Fig.6: 40), **wherein the orientation control film is made of oxide based on perovskite lead lanthanum zirconate titanate and the degree of 111 crystal orientation of the orientation control film is 50 % or more** (col.12, lines 30-35).



With respect to claim 31, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches **a piezoelectric element** (Murai '708: Fig.6: 40), **wherein the orientation control film is made of lead lanthanum zirconate titanate added with at least one of magnesium and manganese in an amount of more than 0 and not more than 10 mol% (col.5, lines 22-26).**

With respect to claim 32, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches **a piezoelectric element** (Murai '708: Fig.6: 40), **wherein the layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) is made of lead zirconate titanate added with at least one of magnesium and manganese in an amount of more than 0 and not more than 10 mol% (col.5, lines 22-26).**

With respect to claim 33, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches **a piezoelectric element** (Murai '708: Fig.6: 40), **wherein the first electrode film (Fig.6: 33) is made of noble metal of Pt, Ir, Pd or Ru or an alloy containing the noble metal (col.6, line 42) and is an aggregate of columnar grains having an average cross-sectional diameter of 20 nm to 30 nm inclusive (Takamatsu et al.: col.7, lines 29-31: disclosing PZT columnar grain diameter of 20 - 50 nm in second layer).**

With respect to claim 34, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches **an inkjet head** (Murai '708: Fig.1: 1)

**comprising: a piezoelectric element (Fig.6: 40) including a first electrode film (Fig.6: 33), an orientation control film, a layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) including a first thin piezoelectric film (Fig.6: 43a) and a second thin piezoelectric film (Fig.6: 43) and a second electrode film (Fig.6: 44) stacked in this order; a diaphragm layer disposed on the second electrode film side surface of the piezoelectric element; and a pressure chamber member (Fig.6: 20) including a pressure chamber (Fig.6: 21) for containing ink which is bonded to the surface of the diaphragm layer opposite to the second electrode film, such that the ink in the pressure chamber is discharged out by displacing the diaphragm layer in the thickness direction by the piezoelectric effect of the layered piezoelectric film (col.3, lines 1-4).**

With respect to claim 35, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 24, teaches an **inkjet head** (Murai '708: Fig.1: 1) **comprising: a piezoelectric element (Fig.6: 40) including a first electrode film (Fig.6: 33), an orientation control film, a layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) including a first thin piezoelectric film (Fig.6: 43a) and a second thin piezoelectric film (Fig.6: 43) and a second electrode film (Fig.6: 44) stacked in this order; a diaphragm layer disposed on the first electrode film side surface of the piezoelectric element; and a pressure chamber member (Fig.6: 20) including a pressure chamber (Fig.6: 21) for containing ink which is bonded to the surface of the diaphragm layer opposite to the first electrode film, such that the ink in the**

**pressure chamber is discharged out by displacing the diaphragm layer in the thickness direction by the piezoelectric effect of the layered piezoelectric film (col.3, lines 1-4).**

With respect to claim 36, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 34, teaches **an inkjet recording device (Murai '708: Fig.1) comprising an inkjet head (Fig.1: 1) and a relative movement mechanism for relatively moving the inkjet head and a recording medium (Fig.1: 1, 4, 5, 6, 7), wherein recording is carried out by discharging the ink in the pressure chamber (Fig.6: 21) from a nozzle hole (Fig.4: 11) communicating with the pressure chamber onto the recording medium while the inkjet head and the recording medium are relatively moved by the relative movement mechanism.**

With respect to claim 37, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 35, teaches **an inkjet recording device (Murai '708: Fig.1) comprising an inkjet head (Fig.1: 1) and a relative movement mechanism for relatively moving the inkjet head and a recording medium (Fig.1: 1, 4, 5, 6, 7), wherein recording is carried out by discharging the ink in the pressure chamber (Fig.6: 21) from a nozzle hole (Fig.4: 11) communicating with the pressure chamber onto the recording medium while the inkjet head and the recording medium are relatively moved by the relative movement mechanism.**

3. Claims 3 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murai (US 6,705,708) in view of Takamatsu et al. (US 6,624,458), as applied to claim 1 above, and further in view of Qiu et al. (US 6,402,304).

With respect to claim 3, the combination of Murai '708 and Takamatsu et al. references, as applied to claim 1, teaches **a piezoelectric element** (Murai '708: Fig.6: 40), **wherein the columnar grains of the second thin piezoelectric film** (Fig.6: 43a, 43) **have an length of 2500 nm to 5000 nm inclusive** (Murai '708: col.8, lines 1-9).

However, the combination of Murai and Takamatsu et al. references does not teach **an average cross-sectional diameter of 60 nm to 200 nm**.

Qiu et al. teaches columnar grains with **an average cross-sectional diameter of 60 nm to 200 nm inclusive** (Abstract, lines 9-12: disclosing PZT columnar grain diameter range of 100 nm to 15,000 nm).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Murai and Takamatsu et al. references to provide columnar grains with an average cross-sectional diameter of 60 nm to 200 nm inclusive, as taught by Qiu et al., in order to promote crystallization under certain conditions layers (Qiu et al.: Abstract, line 19).

With respect to claim 26, the combination of Murai '708, Takamatsu et al., and Qiu et al. references teaches all the limitations of claim 26, as discussed in the 103

rejection of claim 3. Therefore claim 26 is rejected for the same reasons.

4. Claims 4, 5, 27, 28, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murai (US 6,705,708) in view of Takamatsu et al. (US 6,624,458), as applied to claim 1 above, and further in view of Murai (US 6,494,567) and Murai (US 7,083,269).

With respect to claim 4, the combination of Murai '708 and Takamatsu et al. references teaches all the limitations of claim 1 as discussed above.

However, the combination of Murai '708 and Takamatsu et al. references does not teach **a piezoelectric element (Murai '708: Fig.6: 40) according to claim 1, wherein the first and second thin piezoelectric films (Fig.6: 43a, 43) are made of oxide based on perovskite lead zirconate titanate, the degree of 111 crystal orientation of the first thin piezoelectric film is 50 % to 80 % inclusive (Murai, '567: Abstract: disclosing orientation of 100 face at 40 – 70%, 110 face at 10%, therefore 11 face is at 50 – 70%) and the degree of 111 crystal orientation of the second thin piezoelectric film is 95 % to 100 % inclusive (Murai, '269: col.2, lines 1-5: disclosing thin film orientation in the 111 plane of 90% or more).**

Murai '567 teaches **a piezoelectric element (Murai '708: Fig.6: 40) according to claim 1, wherein the first and second thin piezoelectric films (Murai '708: Fig.6: 43a, 43) are made of oxide based on perovskite lead zirconate titanate, the degree of 111 crystal orientation of the first thin piezoelectric film is 50 % to 80 %**

**inclusive** (Murai, '567: Abstract: lines 5-9, disclosing orientation of 100 face at 40 – 70%, 110 face at 10%, therefore 11 face is at 50 – 70%). Murai '269 teaches that **the degree of 111 crystal orientation of the second thin piezoelectric film is 95 % to 100 % inclusive** (Murai, '269: col.2, lines 1-5: disclosing thin film orientation in the 111 plane of 90% or more).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Murai '708 and Takamatsu et al. references to provide that the first and second thin piezoelectric films are made of oxide based on perovskite lead zirconate titanate, the degree of 111 crystal orientation of the first thin piezoelectric film is 50 % to 70 % inclusive, as taught by Murai '567, and the degree of 111 crystal orientation of the second thin piezoelectric film is 95 % to 100 % inclusive, as taught by Murai '269, in order to achieve improved crystallinity (Murai '567: Abstract, lines 10-13).

With respect to claim 5, the combination of Murai '708, Takamatsu et al., Murai '567, and Murai '269 references, as applied to claim 1, teaches **a piezoelectric element (Fig.6: 40) according to claim 1, wherein the chemical composition ratio of the layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) is represented as**

$$[\text{Pb}] : [\text{Zr}] : [\text{Ti}] = (1 + a) : b : (1 - b),$$

**the first and second thin piezoelectric films (Fig.6: 43a, 43) have the same value b of 0.40 to 0.60 inclusive, the first thin piezoelectric film has a larger Pb content**

**than the second thin piezoelectric film (Takamatsu et al.: col.14, lines 32-34), the first thin piezoelectric film (Murai, '708: Fig.6: 43a) has the value a of 0.05 to 0.15 inclusive and the second thin piezoelectric film has the value a of 0 to 0.10 inclusive (Murai '269: col.4, lines 58-63).**

With respect to claim 27, the combination of Murai '708, Takamatsu et al., Murai '567, and Murai '269 references, as applied to claim 24, teaches **a piezoelectric element (Murai '708: Fig.6: 40), wherein the first and second thin piezoelectric films (Fig.6: 43a, 43) are made of oxide based on perovskite lead zirconate titanate, the degree of 111 crystal orientation of the first thin piezoelectric film is 50 % to 80 % inclusive (Murai, '567: Abstract: disclosing orientation of 100 face at 40 – 70%, 110 face at 10%, therefore 11 face is at 50 – 70%) and the degree of 111 crystal orientation of the second thin piezoelectric film is 95 % to 100 % inclusive (Murai, '269: col.2, lines 1-5: disclosing thin film orientation in the 111 plane of 90% or more).**

With respect to claim 28, the combination of Murai '708, Takamatsu et al., Murai '567, and Murai '269 references, as applied to claim 24, teaches **a piezoelectric element (Fig.6: 40), wherein the chemical composition ratio of the layered piezoelectric film (Fig.6: 43; col.8, lines 1-8) is represented as**

$$[\text{Pb}] : [\text{Zr}] : [\text{Ti}] = (1 + a) : b : (1 - b),$$

**the first and second thin piezoelectric films (Fig.6: 43a, 43) have the same value b of 0.40 to 0.60 inclusive, the first thin piezoelectric film has a larger Pb**

**content than the second thin piezoelectric film (Takamatsu et al.: col.14, lines ), the first thin piezoelectric film has the value a of 0.05 to 0.15 inclusive and the second thin piezoelectric film has the value a of 0 to 0.10 inclusive (Murai '269: col.4, lines 58-63).**

With respect to claim 30, the combination of Murai '708, Takamatsu et al., Murai '567, and Murai '269 references, as applied to claim 24, teaches **a piezoelectric element (Murai '708: Fig.6: 40), wherein the chemical composition ratio of the orientation control film is represented as**

$$[\text{Pb}] : [\text{La}] : [\text{Zr}] : [\text{Ti}] = x \text{ times } (1-z) : z : y : (1 - y),$$

**the value x is 1.0 to 1.20 inclusive, the value y is 0 to 0.20 inclusive and the value z is more than 0 and not more than 0.30 (Murai '269: col.4, lines 58-63).**

### ***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Qiu et al. (US 6,455,106) discusses the process of achieving thin film crystallization.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER C. WITKOWSKI whose telephone number is (571)270-3795. The examiner can normally be reached on Monday - Friday 8:00 AM to 5:00 PM EST.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Nguyen can be reached on 571-272-1753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ACW

/Long Nguyen/  
Supervisory Patent Examiner  
Art Unit 4193